WE CLAIM:

1. A neurotrophic, low molecular weight, small molecule heterocyclic ketone or thioester compound.

2. The compound of claim 1, wherein the compound is non-immunosuppressive.

3. The compound of claim 1, wherein the compound has an affinity for an FKBP-type immunophilin.

4. A pharmaceutical composition comprising:
(i) an effective amount of the compound of claim 1; and
(ii) a pharmaceutically acceptable carrier.

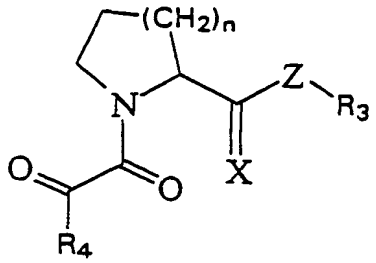
5. A method of effecting a neuronal activity in an animal, comprising administering to said animal an effective amount of the compound of claim 1.

6. The method of claim 5, wherein the neuronal activity is selected from the group consisting of stimulation of damaged neurons, promotion of neuronal regeneration, prevention of neurodegeneration, and treatment of a neurological disorder.

7. The method of claim 6, wherein the neurological disorder is selected from the group consisting of peripheral neuropathy caused by physical injury or disease state, traumatic injury to the brain, physical damage to the spinal cord, stroke associated with brain damage, and neurological disorders relating to neurodegeneration.

8. The method of claim 7, wherein the neurological disorder relating to neurodegeneration is selected from the group consisting of Alzheimer's Disease, Huntington's Disease, Parkinson's Disease, and amyotrophic lateral sclerosis.

9. A compound of formula II:



II

or a pharmaceutically acceptable salt, ester, or solvate thereof, wherein:

n is 1 or 2;

X is O or S;

Z is selected from the group consisting of CH_2, CHR_1 and CR_1R_2;

R_1, R_2, and R_3 are independently selected from the group consisting of C_1-C_5 straight or branched chain alkyl, C_2-C_5 straight or branched chain alkenyl, and Ar, wherein said R_1, R_2, or R_3 is unsubstituted or substituted with one or more substituents independently selected from the group consisting of halo, trifluoromethyl, nitro, C_1-C_6 straight or branched chain alkyl, C_2-C_6 straight or branched chain alkenyl, hydroxy, C_1-C_4 alkoxy, C_2-C_4 alkenyloxy, phenoxy, benzyloxy, amino, and Ar;

R_4 is selected from the group consisting of C_1-C_9 straight or branched chain alkyl, C_2-C_9 straight or branched chain alkenyl, C_3-C_8 cycloalkyl, C_5-C_7 cycloalkenyl, and Ar; and

Ar is aryl, wherein said Ar is unsubstituted or substituted with halo, trifluoromethyl, hydroxy, nitro,

C_1-C_6 straight or branched chain alkyl, C_2-C_6 straight or branched chain alkenyl, C_1-C_4 alkoxy, C_2-C_4 alkenyloxy, phenoxy, benzyloxy, or amino.

10. The compound of claim 9, wherein:
n is 1; and
X is O.

11. The compound of claim 10, wherein Z is CH_2.

12. The compound of claim 11, wherein R_3 is 3-pyridylpropyl and R_4 is 1,1-dimethylpropyl.

13. The compound of claim 11, wherein R_3 is 2-phenylethyl, and R_4 is tert-butyl.

14. The compound of claim 11, wherein R_3 is 3-(4-hydroxyphenyl)propyl and R_4 is 1,1-dimethylpropyl.

15. The compound of claim 11, which is selected from the group consisting of:

(2*S*)-3,3-dimethyl-1-[2-(5-phenylpentanoyl) pyrrolidinyl]pentane-1,2-dione;

(2*S*)-3,3-dimethyl-1-[2-(5-(3-pyridyl) pyrrolidinyl]pentane-1,2-dione;

(2*S*)-2-({1-oxo-5-phenyl}pentyl-1-(3,3-dimethyl-1,2-dioxobutyl)pyrrolidine;

(2*S*)-3,3-dimethyl-1-[2-(5-(4-hydroxyphenyl) pentanoyl)pyrrolidinyl]pentane-1,2-dione;

(2*S*)-2-({1-Oxo-5-phenyl}pentyl-1-(2-Cyclohexyl-1,2-dioxoethyl)pyrrolidine;

2-(1-Oxo-4-phenyl)-butyl-1-(3,3-dimethyl-1,2-dioxobutyl)pyrrolidine;

(2*S*)-2-[5,5-di(4-Fluorophenyl)pentanoyl]-1-(3,3 dimethyl-1,2-pentanedione)pyrrolidine; and

pharmaceutically acceptable salts, esters, or solvates thereof.

16. The compound of claim 15 which is (2*S*)-3,3-dimethyl-1-[2-(5-(3-pyridyl)pyrrolidinyl]pentane-1,2-dione, or a pharmaceutically acceptable salt, ester, or solvate thereof.

17. The compound of claim 15 which is 2-(1-Oxo-4-phenyl)-butyl-1-(3,3-dimethyl-1,2-dioxobutyl)pyrrolidine, or a pharmaceutically acceptable salt, ester, or solvate thereof.

18. The compound of claim 15 which is (2*S*)-3,3-dimethyl-1-[2-(5-(4-hydroxyphenyl)pentanoyl) pyrrolidinyl]pentane-1,2-dione, or a pharmaceutically acceptable salt, ester, or solvate thereof.

19. The compound of claim 9, wherein:
n is 1; and
X is S.

20. The compound of claim 19, wherein Z is CH_2.

21. The compound of claim 9, wherein:
n is 2; and
X is O.

22. The compound of claim 21, wherein Z is CH_2.

23. The compound of claim 22, wherein R_3 is 4-phenylbutyl and R_4 is 1,1-dimethylpropyl.

24. The compound of claim 22, which is selected from the group consisting of:

2-({1-Oxo-6-phenyl}-hexyl-1-(2-Cyclohexyl-1,2-dioxoethyl)piperidine;

2-({1-oxo-6-phenyl}-hexyl) (2*S*)-1-(3,3-dimethyl-1,2-dioxopentyl)piperidine;

3,3-Dimethyl-1-[2-(5-phenylpentanoyl)piperidino]-1,2-pentanedione; and

pharmaceutically acceptable salts, esters, or solvates thereof.

25. The compound of claim 24 which is 2-({1-oxo-6-phenyl}-hexyl) (2*S*)-1-(3,3-dimethyl-1,2-dioxopentyl)piperidine or a pharmaceutically acceptable salt, ester, or solvate thereof.

26. The compound of claim 9, wherein:

n is 2; and

X is S.

27. The compound of claim 26, wherein Z is CH_2.

28. The compound of claim 26, wherein Z is CHR_1.

29. The compound of claim 28, which is 2-({1-Oxo-[2-{2'-phenyl}ethyl]-4-phenyl}-butyl-1-(3,3-dimethyl-1,2-dioxobutyl)piperidine.

30. A pharmaceutical composition comprising:

(i) an effective amount of the compound of claim 9; and

(ii) a pharmaceutically acceptable carrier.

31. The pharmaceutical composition of claim 30, wherein, in said compound:

n is 1; and

X is O.

32. The pharmaceutical composition of claim 31, wherein, in said compound, Z is CH_2.

33. The pharmaceutical composition of claim 32, wherein R_3 is 3-pyridylpropyl and R_4 is 1,1-dimethylpropyl.

34. The pharmaceutical composition of claim 32, wherein R_3 is 2-phenylethyl, and R_4 is tert-butyl.

35. The pharmaceutical composition of claim 32, wherein R_3 is 3-(4-hydroxyphenyl)propyl and R_4 is 1,1-dimethylpropyl.

36. The pharmaceutical composition of claim 32, wherein said compound is selected from the group consisting of:

(2*S*)-3,3-dimethyl-1-[2-(5-phenylpentanoyl) pyrrolidinyl]pentane-1,2-dione;

(2*S*)-3,3-dimethyl-1-[2-(5-(3-pyridyl) pyrrolidinyl]pentane-1,2-dione;

(2*S*)-2-({1-oxo-5-phenyl}pentyl-1-(3,3-dimethyl-1,2-dioxobutyl)pyrrolidine;

(2*S*)-3,3-dimethyl-1-[2-(5-(4-hydroxyphenyl) pentanoyl)pyrrolidinyl]pentane-1,2-dione;

(2*S*)-2-({1-Oxo-5-phenyl}pentyl-1-(2-Cyclohexyl-1,2-dioxoethyl)pyrrolidine;

2-(1-Oxo-4-phenyl)-butyl-1-(3,3-dimethyl-1,2-dioxobutyl)pyrrolidine;

(2*S*)-2-[5,5-di(4-Fluorophenyl)pentanoyl]-1-(3,3 dimethyl-1,2-pentanedione)pyrrolidine; and

pharmaceutically acceptable salts, esters, or solvates thereof.

37. The pharmaceutical composition of claim 36

wherein said compound is (2*S*)-3,3-dimethyl-1-[2-(5-(3-pyridyl)pyrrolidinyl]pentane-1,2-dione, or a pharmaceutically acceptable salt, ester, or solvate thereof.

38. The pharmaceutical composition of claim 36 wherein said compound is 2-(1-Oxo-4-phenyl)-butyl-1-(3,3-dimethyl-1,2-dioxobutyl)pyrrolidine, or a pharmaceutically acceptable salt, ester, or solvate thereof.

39. The pharmaceutical composition of claim 36 wherein said compound is (2*S*)-3,3-dimethyl-1-[2-(5-(4-hydroxyphenyl) pentanoyl)pyrrolidinyl]pentane-1,2-dione, or a pharmaceutically acceptable salt, ester, or solvate thereof.

40. The pharmaceutical composition of claim 30, wherein, in said compound:

n is 1; and

X is S.

41. The pharmaceutical composition of claim 40, wherein, in said compound, Z is CH_2.

42. The pharmaceutical composition of claim 30, wherein, in said compound:

n is 2; and

X is O.

43. The pharmaceutical composition of claim 42, wherein, in said compound, Z is CH_2.

44. The pharmaceutical composition of claim 43, wherein R_3 is 4-phenylbutyl and R_4 is 1,1-dimethylpropyl.

45. The pharmaceutical composition of claim 43, wherein said compound is selected from the group consisting of:

2-({1-Oxo-6-phenyl}-hexyl-1-(2-Cyclohexyl-1,2-dioxoethyl)piperidine;

2-({1-oxo-6-phenyl}-hexyl) (2*S*)-1-(3,3-dimethyl-1,2-dioxopentyl)piperidine;

3,3-Dimethyl-1-[2-(5-phenylpentanoyl)piperidino]-1,2-pentanedione; and

pharmaceutically acceptable salts, esters, or solvates thereof.

46. The pharmaceutical composition of claim 45 wherein said compound is 2-({1-oxo-6-phenyl}-hexyl) (2*S*)-1-(3,3-dimethyl-1,2-dioxopentyl)piperidine.

47. The pharmaceutical composition of claim 30, wherein, in said compound:

n is 2; and

X is S.

48. The pharmaceutical composition of claim 47, wherein, in said compound, Z is CH_2.

49. The pharmaceutical composition of claim 47, wherein, in said compound, Z is CHR_1.

50. The pharmaceutical composition of claim 49, wherein said compound is 2-({1-Oxo-[2-{2'-phenyl}ethyl]-4-phenyl}-butyl-1-(3,3-dimethyl-1,2-dioxobutyl) piperidine.

51. A method for effecting a neuronal activity in an animal, comprising administering to the animal an effective amount of the compound of claim 9.

52. The method of claim 51, wherein the neuronal activity is selected from the group consisting of stimulation of damaged neurons, promotion of neuronal regeneration, prevention of neurodegeneration and treatment of neurological disorder.

53. The method of claim 52, wherein the neurological disorder is selected from the group consisting of peripheral neuropathy caused by physical injury or disease state, traumatic injury to the brain, physical damage to the spinal cord, stroke associated with brain damage, and neurological disorder relating to neurodegeneration.

54. The method of claim 53, wherein the neurological disorder relating to neurodegeneration is selected from the group consisting of Alzheimer's Disease, Huntington's Disease, Parkinson's Disease, and amyotrophic lateral sclerosis.

55. The method of claim 51, wherein, in said compound:

n is 1; and

X is O.

56. The method of claim 55, wherein, in said compound, Z is CH_2.

57. The method of claim 56, wherein R_3 is 3-pyridylpropyl and R_4 is 1,1-dimethylpropyl.

58. The method of claim 56, wherein R_3 is 2-phenylethyl, and R_4 is tert-butyl.

59. The method of claim 56, wherein R_3 is 3-(4-

hydroxyphenyl)propyl and R_4 is 1,1-dimethylpropyl.

60. The method of claim 56, wherein said compound is selected from the group consisting of:

(2*S*)-3,3-dimethyl-1-[2-(5-phenylpentanoyl) pyrrolidinyl]pentane-1,2-dione;

(2*S*)-3,3-dimethyl-1-[2-(5-(3-pyridyl) pyrrolidinyl]pentane-1,2-dione;

(2*S*)-2-({1-oxo-5-phenyl}pentyl-1-(3,3-dimethyl-1,2-dioxobutyl)pyrrolidine;

(2*S*)-3,3-dimethyl-1-[2-(5-(4-hydroxyphenyl) pentanoyl)pyrrolidinyl]pentane-1,2-dione;

(2*S*)-2-({1-Oxo-5-phenyl}pentyl-1-(2-Cyclohexyl-1,2-dioxoethyl)pyrrolidine;

2-(1-Oxo-4-phenyl)-butyl-1-(3,3-dimethyl-1,2-dioxobutyl)pyrrolidine;

(2*S*)-2-[5,5-di(4-Fluorophenyl)pentanoyl]-1-(3,3 dimethyl-1,2-pentanedione)pyrrolidine; and

pharmaceutically acceptable salts, esters, or solvates thereof.

61. The method of claim 60 wherein said compound is (2*S*)-3,3-dimethyl-1-[2-(5-(3-pyridyl) pyrrolidinyl]pentane-1,2-dione, or a pharmaceutically acceptable salt, ester, or solvate thereof.

62. The method of claim 61 wherein said compound is 2-(1-Oxo-4-phenyl)-butyl-1-(3,3-dimethyl-1,2-dioxobutyl)pyrrolidine, or a pharmaceutically acceptable salt, ester, or solvate thereof.

63. The method of claim 61, wherein said compound is (2*S*)-3,3-dimethyl-1-[2-(5-(4-hydroxyphenyl)pentanoyl) pyrrolidinyl]pentane-1,2-dione, or a pharmaceutically acceptable salt, ester, or solvate thereof.

64. The method of claim 51, wherein, in said compound:

n is 1; and

X is S.

65. The method of claim 64, wherein, in said compound, Z is CH_2.

66. The method of claim 51, wherein, in said compound:

n is 2; and

X is O.

67. The method of claim 66, wherein, in said compound, Z is CH_2.

68. The method of claim 67, wherein R_3 is 4-phenylbutyl and R_4 is 1,1-dimethylpropyl.

69. The method of claim 67, wherein said compound is selected from the group consisting of:

2-({1-Oxo-6-phenyl}-hexyl-1-(2-Cyclohexyl-1,2-dioxoethyl)piperidine;

2-({1-oxo-6-phenyl}-hexyl) (2*S*)-1-(3,3-dimethyl-1,2-dioxopentyl)piperidine;

3,3-Dimethyl-1-[2-(5-phenylpentanoyl)piperidino]-1,2-pentanedione; and

pharmaceutically acceptable salts, esters, or solvates thereof.

70. The method of claim 69, wherein said compound is 2-({1-oxo-6-phenyl}-hexyl) (2*S*)-1-(3,3-dimethyl-1,2-dioxopentyl)piperidine.

71. The method of claim 51, wherein, in said

compound:

n is 2; and

X is S.

72. The method of claim 71, wherein, in said compound, Z is CH_2.

73. The method of claim 71, wherein in said compound, Z is CHR_1.

74. The method of claim 73, wherein said compound is 2-({1-Oxo-[2-{2'-phenyl}ethyl]-4-phenyl}-butyl-1-(3,3-dimethyl-1,2-dioxobutyl)piperidine.

75. The compound of claim 1, wherein the compound has a molecular weight no more than about 800 daltons.

76. The compound of claim 1, wherein the compound has a molecular weight no more than about 500 daltons.

77. The compound of claim 1, wherein the compound has a molecular weight no more than about 330 daltons.

78. The compound of claim 1, wherein the compound exhibits a Chick Dorsal Root Ganglion Neurite Outgrowth Assay ED_{50} value of less than about 10 nM.

79. The compound of claim 1, wherein the compound exhibits a Chick Dorsal Root Ganglion Neurite Outgrowth Assay ED_{50} value of less than about 1.0 nM.

80. The compound of claim 1, wherein the compound exhibits a Chick Dorsal Root Ganglion Neurite Outgrowth Assay ED_{50} value of less than about 0.1 nM.

81. The compound of claim 1, wherein the compound exhibits an MPTP Assay value which is greater than about 20% recovery of TH-stained dopaminergic neurons.

82. The compound of claim 1, wherein the compound exhibits an MPTP Assay value which is greater than about 35% recovery of TH-stained dopaminergic neurons.

83. The compound of claim 1, wherein the compound exhibits an MPTP Assay value which is greater than about 50% recovery of TH-stained dopaminergic neurons.